

# DURAPLUS™ ABS FOR SECONDARY LOOP REFRIGERATION CONTROL SYSTEMS



**Duraplus™**  
ABS INDUSTRIAL SYSTEM

## SECONDARY LOOP REFRIGERATION CONTROL SYSTEMS

- High Pressure Pipe, Valve & Fittings
- Environmentally Friendly Cooling Systems
- Low Temperature Fluid Transportation

  
**IPEX**  
by *alixis*

We build tough products for tough environments®

# IPEX Duraplus™ ABS System

A Reliable Solution for Secondary Loop Refrigeration Control Systems



**G**rowing environmental, material and labor concerns have led to the adoption of secondary loop refrigeration systems. Secondary Loop glycol refrigeration systems have been in use for many years in Europe and have proven to be a cost effective and reliable alternative to traditional Direct Expansion refrigeration systems. Environmental concerns are met and costs savings are accomplished by reducing the amount of refrigerant, high pressure pipe and complex valves that are needed in a refrigeration system.

## Secondary Loop refrigeration can\*:

- ↓ Reduce energy consumption by **4.9%** per year
- ↓ Reduce the use of environmentally harmful refrigerant by **83%**
- ↓ Reduce CO<sub>2</sub> emissions by **14,000** tons per year
- ↓ Reduce maintenance costs by **20%**
- ↑ Improve the quality of refrigerated foods

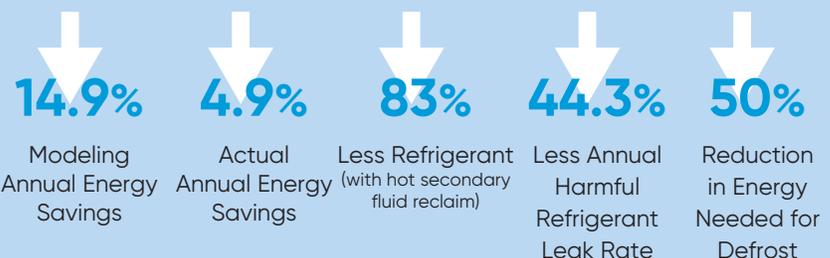
\* Source: California Energy Commission (2004)



## COMPARISON STUDIES



In 2004, the California Energy Commission conducted a comparison study of a Secondary Loop Refrigeration system versus a high efficiency direct expansion multiplex system. The results were compared at the end of the nine month study and it was found that secondary loop refrigeration allowed for:



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IPEX offers its Duraplus ABS (Acrylonitrile Butadiene Styrene) material as a complete IPS (1/2" to 8") pressure pipe, valve, and fitting system ideal for secondary refrigeration systems, chilled water lines, cooling tower piping, condensate, and many other low temperature fluid transport applications.

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### DURAPLUS ABS FEATURES:

- ✓ Large Temperature Operating Range (-40°F to 140°F) (-40°C to 60°C)
- ✓ High Impact Strength
- ✓ Outstanding Ductility
- ✓ Wide Chemical Resistance
- ✓ Long Term UV Resistance
- ✓ Easy and Proven Joining Methods
- ✓ Competitive Install Costs
- ✓ No Scaling
- ✓ Low Thermal Conductivity
- ✓ Lightweight
- ✓ Smooth Bore
- ✓ 50 Year Service Life Guarantee



In 2005, Natural Resources Canada conducted a study within a national supermarket chain in Quebec that featured a secondary loop refrigeration system. They concluded that:

↓  
**23%**

Total Energy  
Consumption

↓  
**71%**

Synthetic  
Refrigerant Charge

↓  
**94%**

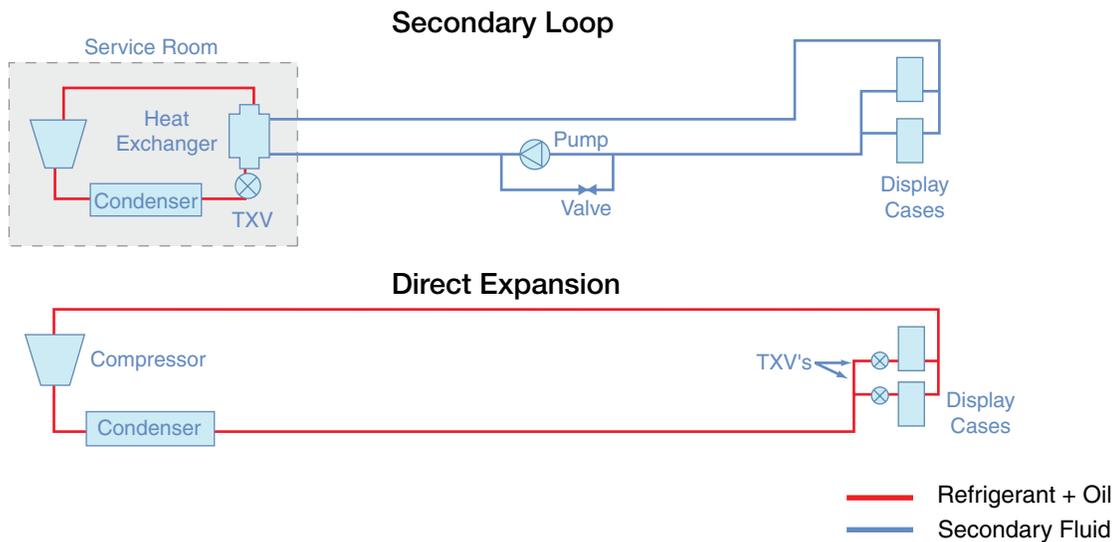
Synthetic  
Refrigerant Leak

↓  
**76%**

Total  
Emissions

# Duraplus ABS: Perfect Fit for Secondary Loop Refrigeration Control Systems

## HOW SECONDARY LOOP REFRIGERATION CONTROL SYSTEMS WORK



Secondary Loop refrigeration control systems contain two separate cooling loops that are connected through a heat exchanger.

The First loop in the system is similar to a traditional direct expansion refrigeration system but is contained in a service room in the building. In secondary refrigeration, the first loop is smaller and uses standard refrigerants and piping products. This design minimizes the amount of pipe, complex valves and harmful refrigerants that are required. Reducing the size of the direct expansion system and segregating it from the public area reduces installation costs, maintenance costs, refrigerant leaks and potential contamination.

The larger Secondary loop contains a chilled glycol/ water fluid that is circulated throughout the building, at low pressures, using pumps. This larger loop transfers heat from the display cases to the direct expansion system through a heat exchanger. This is what allows for efficient environment control of freezers, and coolers. The secondary loop is optimized by using the light weight, durable, non-corrosive Duraplus Industrial system. The effective joining method, impact resistance and low operating pressure of this system greatly reduce the risk of leaks and failures. Installation costs are reduced and no special tools or permits are required during installation.



## Glycol with Duraplus ABS

Depending on the application, glycol is often mixed with water to allow for the fluid to operate at a temperature below the freezing point of water alone. The concentration levels of glycol will determine the maximum cooling capabilities and efficiency of the system. The two most commonly used glycols are Ethylene Glycol and Propylene Glycol. Though Propylene Glycol comes at a greater cost, it is most commonly used in secondary loop refrigeration because of its lower environmental and safety impact.



## Organic Salts with Duraplus ABS

For applications approaching  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ), Glycol solutions become inefficient. Their inherent viscosity increases as temperature drops and they become inefficient to pump. It is at this stage organic salts become the secondary coolant of choice. A number of organic salts are used in secondary refrigeration, including potassium formate, potassium acetate, and calcium chloride. All three are food safe and relatively inexpensive; however, calcium chloride is highly corrosive. Duraplus Industrial ABS is chemically resistant to all three of these organic salts and can be used in conjunction with them in a secondary loop refrigeration system that requires very low temperatures. Similar to Glycols, the concentration levels will determine the maximum cooling capabilities and efficiency of the system.

### SUITABLE SECONDARY REFRIGERANTS FOR USE WITH DURAPLUS ABS

Heat Transfer Chemical	Chemical Nomenclature	Operating Temperature Range	Maximum Antifreeze Concentration	Suitable Piping System	CAS Number
Propylene Glycol / Monopropylene Glycol / 1, 2 Propanediol	$\text{CH}_3\text{CH}(\text{OH})-\text{CH}_2\text{OH}$	$-40^{\circ}\text{F}$ to $176^{\circ}\text{F}$ ( $-40^{\circ}\text{C}$ to $80^{\circ}\text{C}$ )	Up to 100%	Duraplus ABS Industrial	57-55-6
Potassium Formate	$\text{KO}_2\text{CH}$	$-76^{\circ}\text{F}$ to $122^{\circ}\text{F}$ ( $-60^{\circ}\text{C}$ to $50^{\circ}\text{C}$ )	Up to 100%	Duraplus ABS Industrial	590-29-4
Potassium Acetate	$\text{C}_2\text{H}_3\text{KO}_2$	$-60^{\circ}\text{F}$ to $122^{\circ}\text{F}$ ( $-51^{\circ}\text{C}$ to $50^{\circ}\text{C}$ )	Up to 100%	Duraplus ABS Industrial	127-08-2
Calcium Chloride	$\text{CaCl}_2$	$-60^{\circ}\text{F}$ to $23^{\circ}\text{F}$ ( $-51^{\circ}\text{C}$ to $-5^{\circ}\text{C}$ )	Up to 100%	Duraplus ABS Industrial	10035-04-8

**NOTES:** Propylene glycol, Monopropylene glycol and 1, 2 Propanediol are the same chemical. These are three different names currently used in industry for PG.

Please consult IPEX for recommendation on other glycols or organic salts.

Use only Duraplus ABS Industrial at an operating temperature range of  $-40^{\circ}\text{F}$  to  $140^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $60^{\circ}\text{C}$ )

## Fast and Reliable Joining Method

Solvent welding offers a quick and secure means of producing high integrity welded joints that will remain leak proof throughout the life of the system. Unlike the soldering and welding of metal pipe systems, special permits are not required.



# Duraplus ABS Combines Corrosion, Resistance, Toughness & Economy

## DURAPLUS ABS IN SECONDARY LOOP REFRIGERATION CONTROL SYSTEMS

When considering secondary loop refrigeration control systems, pipe work is of prime importance. The reliable containment and efficient movement of fluid in pipes is essential to every refrigeration system. Duraplus Industrial ABS offers tremendous advantages to the refrigeration industry for low temperature fluid transportation piping systems.

### Non Corroding Smooth Inner Diameter

The extrusion and injection molding process used to manufacture Duraplus produces an exceptionally smooth inner diameter for both the pipe and fittings. This results in low frictional head losses, saving on pump running costs and in some cases allows for the selection of smaller pipe sizes. ABS is completely resistant to environmental corrosion from the formation of condensate on the outer surface of the pipe and is inert to many of the aqueous solutions and anti-freezes employed by refrigeration systems. The smooth inner diameter, together with the corrosion resistance of ABS, inhibits the formation of scale.



Non Corrodible

### Tough and Ductile down to -40°F (-40°C)

The butadiene component in ABS gives the material exceptional strength, especially in the form of impact resistance, making Duraplus more resistant to damage than many metals or plastics. Duraplus ABS has a wide operational temperature ranging from 140°F (60°C) and remains ductile at temperatures as low as -40°F (-40°C). This ductility allows the material to function at these low temperatures without risk of brittle fracture due to impact.



Tough and Durable

### Reduced Insulation Costs

Duraplus Industrial ABS has low thermal conductivity, minimizing heat gain (or loss) and reducing condensation formation. The need for insulation is reduced or often eliminated.

### Lightweight

At half the weight of copper and one-sixth the weight of steel pipe, ABS is much easier to handle and install.



Low Thermal Conductivity

## Product Range and Compliance

The ABS compound used in the manufacturing of Duraplus ABS Industrial Pipe conforms to a cell classification 43232 and complies with the material requirements of ASTM D3965, "Standard Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings". The ABS material has an IZOD impact resistance of not less than 5ft·lbf/in at -22°F (-30°C) as per ASTM D256.

Pipe shall be manufactured by IPEX and designed on a Standard Dimension Ratio (SDR) basis to give various pressure ratings.

Pipe Class	Continuous Pressure Rating at 73°F (23°C)	Size Range
Class C	145 psi	1" – 8"
Class E	230 psi	1/2" – 4"
Class T	180 psi	1/2" – 2"

Fittings and valves are available to complete the system

## Duraplus ABS Industrial System Valves



VKD & VXE Series  
Ball Valves



FK Series  
Butterfly Valves



DK Series  
Diaphragm Valves



VM Series  
Diaphragm Valves



SXE  
Ball Check Valves



RV  
Sediment Strainer

## SALES AND CUSTOMER SERVICE

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### About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the world's largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial process piping systems
- Electrical systems
- Telecommunications and utility piping systems
- Irrigation systems
- Industrial, plumbing and electrical cements
- PVC, CPVC, PP, PVCO, ABS, PEX, FR-PVDF, NFRPP, FRPP, HDPE, PVDF and PE pipe and fittings (1/2" to 60")

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A policy of ongoing product improvement is maintained. This may result in modifications of features and/or specifications without notice.

